VI. BAG FILTRATION

A. Description of Unit

Bag filtration is similar to cartridge filtration in that it uses numerous types of fabricated media enclosed in housings and the filter media and housings are constructed of materials compatible with the waste stream being treated. Unlike cartridge filtration, some bag filters may be backwashed to extend media life and operation. Bag filters are effective at straining slurries and dispersions and removing particle sizes in the range of 20-200 microns. Bag filters can remove particles down to 5 microns and, on occasion and depending on waste stream characteristics, they have been used to filter particles in the 1-3 micron range

B. Media

1. Type of Media

The types of media used to manufacture bag filters are similar to those used to manufacture cartridge filters and include cotton, nylon, polypropylene, polyester, teflon, glass and saran. Material such as ceramic and metals are not used for manufacturing of bag filters but these material are used in bag filter restrainers, fittings and housings. Selection of the media as with cartridge filters is dependent on waste stream characteristics, filter operating conditions and desired effluent quality.

Similar to cartridge filters, bag filters can also be composed of several media types. It is important to ascertain the compatibility of each filter media with the particular waste stream. Refer to Tables V-I and V-2 for filter media compatibility with various waste streams.

2. Configuration

There are two basic bag filtration system designs, open and closed. Open systems are most often used in straining liquid slurries or dispersions where particles are screened by the filter fabric while the slurry or dispersion passes through the filter media. Typical applications include filtration of gelatinous particles from paints or highly viscous slurries where high flow rates are needed, i.e., removal of particles from enamel in the paint processing industry. Open system operation typically has the bags attached to an open ended pipe via a tie strap or snap ring. The material to be filtered is then poured into the bag and the strained material is captured in a container below the filter setup. Because this arrangement has open exposure to the waste stream, it has limited use in treating hazardous wastes because some hazardous wastes may contain volatile components.

The closed system design has advantages in that operations staff are not exposed to the material being filtered and filter cake can be removed from the filter and housing without having to open the filter. During filtration cake builds up on the filter media. As pressure drop across the system increases the system can be back-pulsed with either air or water to remove the cake from the filter. Filter cake is then removed from the bottom of the housing. For some systems the back-pulsing takes only 1 to 3 seconds and filtration begins after back-pulsing providing almost continuous operation. See Figures A-l8 and A-19 for closed system configurations

3. Media Support System

As with cartridge filters, bag filter housings need to be compatible with the system pressure and operating temperature, handle corrosive fluids, economically house the number of elements required, provide reliable seals to prevent fluid bypassing and account for easy replacement of filter elements.

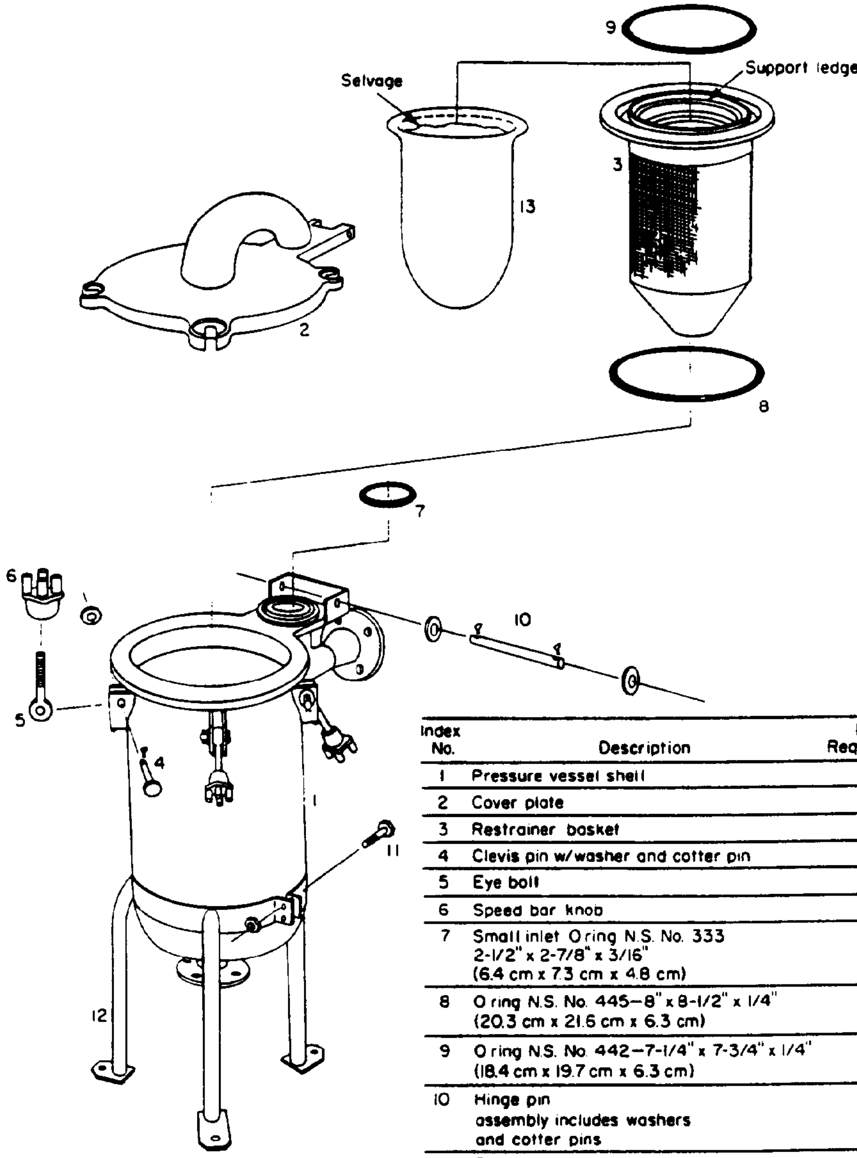
To handle corrosive waste streams housings can be constructed of a variety of steel and nickel alloys with multiple type liners available. Housings must meet pressure vessel codes.

In addition to providing a tight seal to minimize waste stream by-pass bag filters may require metal, ceramic or plastic re-strainers inserted inside the bag to maintain bag shape under pressure.

C. operating/Design Considerations

Bag filter operation must provide for a positive 360° circumferential sealing of the bag to assure that waste stream particulate contaminants do not enter the effluent stream. For this reason positive vessel sealing should be used under all operating conditions.

Depending on system selection, the bags should be easily accessible and removable. For open systems all the contaminants should be contained in the bag. For closed systems the particulate cake builds up on the outside of the filters and in continuous operating systems the cake should be easily removed from the housing without the need to open the system. Also in closed



Index No.	Description	No. Required
1	Pressure vessel shell	1
2	Cover plate	1
3	Restrainer basket	1
4	Clevis pin w/washer and cotter pin	4
5	Eye bolt	4
6	Speed bar knob	4
7	Small inlet O ring N.S. No. 333 2-1/2" x 2-7/8" x 3/16" (6.4 cm x 7.3 cm x 4.8 cm)	1
8	O ring N.S. No. 445—8" x 8-1/2" x 1/4" (20.3 cm x 21.6 cm x 6.3 cm)	1
9	O ring N.S. No. 442—7-1/4" x 7-3/4" x 1/4" (18.4 cm x 19.7 cm x 6.3 cm)	1
10	Hinge pin assembly includes washers and cotter pins	1 2 2
11	Bolt w/locknut	2
12	Leg assembly	1
13	Filter bag ("snap ring")	1

FIGURE A-18. CLOSED BAG FILTER DETAIL

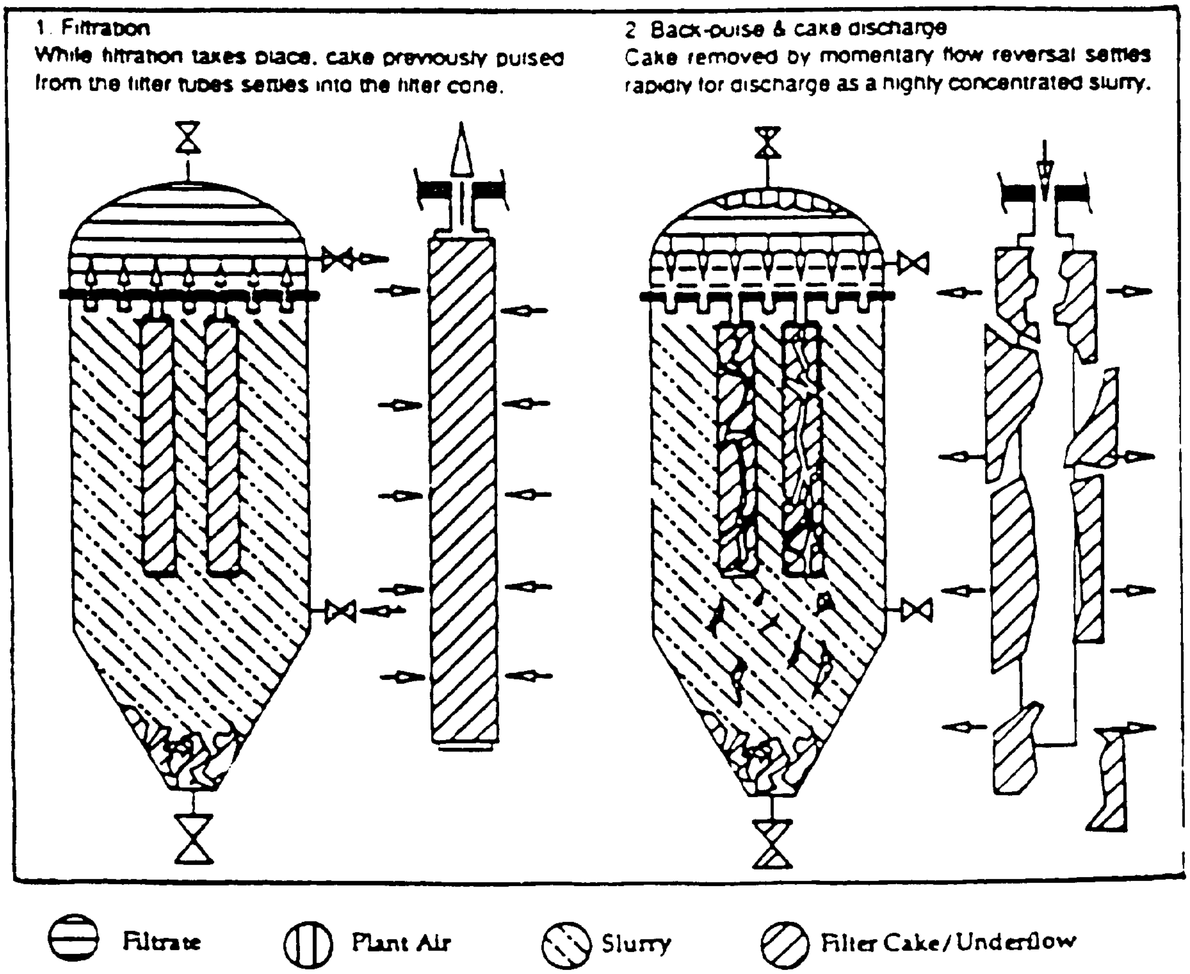


FIGURE A-19. BACK-PULSE BAG FILTRATION SYSTEM

systems the restrainers should not impair flow or the life of the filter element.

D. Advantages/Disadvantages

Bag filters come in a variety of sizes ranging from 0.05 square meters per bag to 0.40 square meters per bag (0.5-4 ft^2) with respective flow rates of 1.5 to 12.5 liters per second (25-200 gpm). Bag filter housings can hold from 1 to 24 bags. The designer should consult vendor literature for specific details on bags and housings.

Economically one bag filter has the equivalent capacity of several cartridges and can operate at higher flow rates than cartridge filters with lower pressure drops. The filtrate can be removed from the bag for disposal unlike cartridge filtration where the entire filter element must be disposed of. For closed systems there is little need for the operators to handle contaminated material except during removal of filters for cleaning or replacement. Bag filters can also treat highly viscous fluids up to 200,000 cP (484,000 lb/hr•ft). Because of their high volume throughput they can provide space saving polishing filtrate from clarifier/thickener overflows and from sand and vacuum filters.

One drawback of filter bags is that sharp objects present in the waste stream such as metal fillings can cut into the bags during operation impacting effluent quality and filter life.

E. Backwash Disposal

There are two basic residual streams which need to be characterized to determine disposal alternatives. The two waste streams are the backwash water used to remove/clean filter cake from the filter media. The second residual stream is the solids captured during filtration and removed from the filter media during backwash. In the case of cartridge filters, contaminants which are caked on the filter media require disposal of the entire filter element. The properties of these residual waste streams is a function of the quality of water being treated.

Backwash water is generally returned to the head end of the plant or backwash water recovery facilities. Because backwashing occurs at very high flows for short durations, design of treatment facilities where the backwash water is returned to the process stream or backwash water recovery facilities must take into account high intermittent flows which could produce hydraulic upsets.

For the particulate residuals, the quantities of sludge produced can be estimated based on the suspended solids in the raw water and the anticipated treated effluent water quality. Calculations used to estimate sludge generation must also include any coagulant used as a filtration aid. Particulate residuals generated during filtration of hazardous or industrial wastes must also be characterized to determine if the sludges are hazardous and require off-site disposal in a secure manner. In some cases sludges from HTRW treatment may continue to be regulated as hazardous if the waste stream was associated with a listed hazardous waste. The designer should always check the source of contamination when identify treatment and disposal options. RCRA must be considered when identifying sludge treatment and disposal options.

F. Reference. See Appendix D.